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| 10/816,603 | 04/02/2004 | Martin N. Wybourne | 1505-68152 | 9819 |

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| **ART UNIT** | **PAPER NUMBER** |
| 1639 | |

DATE MAILED: 05/11/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/816,603 | WYBOURNE ET AL. | |
| | Examiner | Art Unit | |
| | Bennett Celsa | 1639 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) 1-3 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-3 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 42/04.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.



ED

## DETAILED ACTION

### Status of the Claims

Claims 1-3 are currently pending.

### *Election/Restrictions*

1. Applicant's election with traverse of polylysine as the polypeptide "biomolecular scaffold"; Au as the "metal" species; and thiol as the "ligand" in the reply filed on 1/24/05 is acknowledged. The traversal is on the ground(s) that "an unduly extensive and burdensome search" has not been demonstrated. This is not found persuasive because of the reasonsprovided in the restriction/election of species requirement e.g. structurally distinct arrays classifiable in different areas that require burdensome manual/computer bibliographic/classification search.

The requirement is still deemed proper and is therefore made FINAL.

### *Priority*

2. Applicant has not complied with one or more conditions for receiving the benefit of an earlier filing date under 35 U.S.C. 120 as follows:

The later-filed application must be an application for a patent for an invention which is also disclosed in the prior application (the parent or original nonprovisional application or provisional application); the disclosure of the invention in the parent application and in the later-filed application must be sufficient to comply with the requirements of the first paragraph of 35 U.S.C. 112. See *Transco Products, Inc. v. Performance Contracting, Inc.*, 38 F.3d 551, 32 USPQ2d 1077 (Fed. Cir. 1994).

Original claim 1 (and claims dependent thereon) inserts new claim limitations (e.g. "linear"; "predetermined positions"; "organized"; "electrically isolated"; "one dimensional arrays"; and "current above a threshold in applied voltage" which is not supported by prior family applications 10/013,334; 09/085,390; and 60/047,804, nor does applicant indicate where such support is present. Accordingly, 35 USC 120 priority to these applications is hereby denied, making the present application's filing date (4/2/04) the date for purposes of prior art.

3. This application repeats a substantial portion of prior Application No. 10/013,334; 09/085,390; and 60/047,804, and adds and claims additional disclosure not presented in the prior application. Since this application names an inventor or inventors named in the prior application, it may constitute a continuation-in-part of the prior application. Should applicant desire to obtain the benefit of the filing date of the prior application, attention is directed to 35 U.S.C. 120 and 37 CFR 1.78.

***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1-3 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a. In claim 1, the term "biomolecular scaffold" lacks metes and bounds as to what compounds, outside of polypeptides and/or polynucleotides are encompassed by this

terminology. What characteristics and/or structure classify a compound as being biomoledular or non-biomolecular?

b. In claim 1 (and claims dependent thereon), the limitation "one dimensional array" is confusing since the metal nanocluser arrays would possess X/Y dimensions (e.g. 2 dimensions ?) regarding the clusters spacial orientation vis a vis each other plus a height above (e.g. Z-axis) the substrate. Accordinglyy the use of the terminology "one dimensional arrays" in the present context is indefinite.

***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting

directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claim 1 is rejected under 35 U.S.C. 102(a,b,e) as being anticipated by Heath et al. U.S.Pat. No. 6,159,620 (12/00: filed 3/97) alone and in combination with the specification (e.g. pages 10-11) as evidence of inherency.

The presently claimed invention (e.g. claim 1) is drawn to:

An organized array of metal clusters, comprising:

i. Monodispersed, ligand (e.g. thiol)-stabilized metal (e.g. Au) clusters having metal-cluster radii of @ 0.7 nm to @1.8nm;

ii. a linear, biomolecular scaffold (e.g. exemplified as polynucleotides/polypeptides BUT NOT SO LIMITED) , the metal clusters being bonded to the scaffold

iii. a substrate

the scaffold being coupled to the substrate at predetermined positions to form organized, one dimensional arrays that are electrically isolated from one another and having a linear increase in current above a threshold in applied voltage.

It is noted that

It is noted that "polylysine" *inherently* is a "helical peptide" within the presently claimed scope since "The free base form of polylysine readily forms an alpha helix" and "[M]oreover, lysine provides a terminal amino group that is oriented favorably in the alpha helix for ligand exchange reactions with the ligand-stabilized metal clusters". See specification at page 15, lines 15-24.

It is also noted that the term "array" is defined as "any arrangement of plural such clusters" **that is useful for forming electronic devices,** the bolded language representing "intended use" language which is not afforded patentable weight.

Similarly the newly added limitations:

"that are electrically isolated from one another" (e.g. product-by-process); and

"having a linear increase in current above a threshold in applied voltage" (e.g. inherent property of intended semiconductor device use) which address product-by-

process limitations and/or address inherent characteristics addressing intended use (e.g. formation of semiconductor devices) are not afforded patentable weight.

Heath et al. teach "room temperature" electronic devices displaying characteristic Coulomb blockage (e.g. see abstract) comprising:

Mono- or multi- layer assemblies of "organically functionalized metal (e.g. Au) nanocrystals" (1-10 nm; e.g. "between about 0.7 nm and about 1.8 nm") (e.g. see col. 2) in which the organic portion (e.g. the "scaffold" or "biomolecular scaffold" ) is "coupled" to the "metal (alloy) nanocrystals" by functional group (e.g. thiols). Attachment of these metal nanocrystals via the "scaffold" (e.g. organic portion) to a substrate as monolayer/multilayer nanocrystal assemblies form "patterns" within the scope of the presently claimed invention (e.g. see Figures, especially figures 1 and 2; see col. 3-6, especially col. 3, lines 23-38 and ability to form "well-ordered" monolayer/multilayer nanocrystal assemblies).

The reference metal nanoparticles'

a. "maximum physical separation ... is limited by the nanoparticles being coupled to a biomolecular scaffold " (as presently claimed); and

b. are *"inherently"* spaced at a distance of less than about 3 nm, since the specification on page 10 (especially 1st full paragraph) indicates that operable electronic devices based on coulomb blockage at room temperature (as in the reference teaching) must comprise nanoparticle core diameters of between about 0.7-5nm with scaffold attachment AND possess **nanoparticle spacing of a distance less than about 5 nm**. Accordingly, the reference nanoparticles are spaced" less that about 5

nm" which is within the scope of "less than about 3 nm"; and in any event the Examiner lacks the means of measuring and comparing the prior art device with that presently claimed. Similarly, the reference devices must inherently exhibit a " linear current increase between the 1st and 2nd nanoparticles (at about room temperature) as the potential difference between the two nanoparticles is increased above a threshold value" since this limitation is disclosed (e.g. specification pages 10-11) as being met by "electronic devices comprising the nanoparticles described herein" (e.g. "Because of their unique architecture"). Accordingly, the reference's device, which meets the present claim limitations' "unique architecture" must inherently meet the present claim limitations. It is noted that the PTO lacks facilities to make comparisons between prior art and claimed compositions/apparatus etc.

10. Claim 1 is rejected under 35 U.S.C. 102(a,b) as being anticipated by Peschel et. al. Angew Chem. Int Ed. Vol. 34 No. 13/14 (1995) pages 1442-1443 alone and in combination with the specification (e.g. pages 10-11) as evidence of inherency..

The presently claimed invention (e.g. claim 1) is drawn to:

An organized array of metal clusters, comprising:

i. Monodispersed, ligand (e.g. thiol)-stabilized metal (e.g. Au) clusters having metal-cluster radii of @ 0.7 nm to @1.8nm;

ii. a linear, biomolecular scaffold (e.g. exemplified as polynucleotides/polypeptides BUT NOT SO LIMITED) , the metal clusters being bonded to the scaffold

iii. a substrate

the scaffold being coupled to the substrate at predetermined positions to form organized, one dimensional arrays that are electrically isolated from one another and having a linear increase in current above a threshold in applied voltage.

It is noted that the term "array" is defined as "any arrangement of plural such clusters" **that is useful for forming electronic devices,** the bolded language representing "intended use" language which is not afforded patentable weight.

Similarly the newly added limitations:

"that are electrically isolated from one another" (e.g. product-by-process); and

"having a linear increase in current above a threshold in applied voltage" (e.g. inherent property of intended semiconductor device use) which address product-by-process limitations and/or address inherent characteristics addressing intended use (e.g. formation of semiconductor devices) are not afforded patentable weight.

Peschel et al. disclose "organized" ligand stabilized (one dimensional) arrays of "monodispersed" (e.g. identical sized see e.g. fig. 1) metal (e.g. Au55: cluster core about 1.4 nm in diameter) clusters (covalently) attached to a "(biomolecular) scaffold" (e.g. polyethyleneimine) which is (covalently) attached to a substrate (E.g. mica) (see e.g. Fig. 2); with the equidistant Au55 clusters averaging a distance of 2.4 $\pm$ 0.2 nm apart (e.g. "distance of less than about 3nm"). The Peschel compositions comprises the same components with the same composition and parameters as presently claimed. The reference array are capable of being made into electronic devices since the reference teaches that: "In a close packed three dimensional arrangement these **clusters show conductivity**, which is characterized by **single electron tunneling**

(SET) processes between the cluster cores separated by the ligand shells" (e.g. see page 1442 bottom-top of page 1443: emphasis provided)

The ability of the reference electronic device to:

a. "operate at or about room temperature based on the Coulomb blockade effect";

and/or

b. upon operation, "exhibit a substantially linear current increase between the 1st and 2nd nanoparticles (e.g. at about room temperature) as the potential difference between the two nanoparticles is increased above a threshold value"

represent "intended use" limitations regarding the reference device which is not afforded patentable weight or alternatively the above-recited operation characteristics (e.g. room-temperature operation by coulomb blockade and substantial linear current upon potential beyond threshold) would be deemed "inherent" since the:

the specification on page 10 (1st full paragraph) indicates that devices possessing the presently claimed nanoparticle composition (e.g. nanonparticle diameter range and inter-nanoparticle spacing) are operable at room temperature based on Coulomb blockade) and "exhibit a substantially linear current increase between the 1st and 2nd nanoparticles (e.g. at about room temperature) as the potential difference between the two nanoparticles is increased above a threshold value" (e.g. see specification bottom of page 10-top of page 11. It is noted that the PTO lacks facilities to make comparisons between prior art and claimed compositions/apparatus etc

11. Claims 1-2 are rejected under 35 U.S.C. 102(a,b) as being anticipated under 35 U.S.C. 102(a,b,e) as being anticipated by Alivisatos et al. Nature Vol. 382 (Aug. 15 1996) pages 609-611 alone and in combination with the specification as evidence of inherency.

The presently claimed invention is drawn to:

An organized array of metal clusters, comprising:

i. Monodispersed, ligand (e.g. thiol)-stabilized metal (e.g. Au) clusters having metal-cluster radii of @ 0.7 nm to @1.8nm;

ii. a linear, biomolecular scaffold (e.g. polypeptides/polynucleotides) , the metal clusters being bonded to the scaffold

iii. a substrate

the scaffold being coupled to the substrate at predetermined positions to form organized, one dimensional arrays that are electrically isolated from one another and having a linear increase in current above a threshold in applied voltage.

It is noted that the term "array" is defined as "any arrangement of plural such clusters" **that is useful for forming electronic devices,** the bolded language representing "intended use" language which is not afforded patentable weight.

Similarly the newly added limitations:

"that are electrically isolated from one another" (e.g. product-by-process); and

"having a linear increase in current above a threshold in applied voltage" (e.g. inherent property of intended semiconductor device use) which address product-by-

process limitations and/or address inherent characteristics addressing intended use (e.g. formation of semiconductor devices) are not afforded patentable weight.

Allivastos et al. teach :

Array comprising nanoscale crystals possessing "electronic... behaviour" and the "nanocrystal assembly" constitutes comprising:

1.4 nm diameter (e.g. see page 610, right column: e.g. "between about 0.7 nm and about 1.8 nm" as presently claimed) "plural" Gold (Au) (e.g. metal) clusters "coupled" to antiparellel /parallel 1st and 2nd (biomolecular) "intersecting" DNA scaffolds (e.g. reading on present claim 19) in which the Au particles are spaced anywhere " from 2.6-12.5 nm and 2.6-7.5 nm due to combined lengths of the linkers and ligand shells" (e.g.see page 611 right column and figures 1-3).

The reference arays' ability to be formulated into electronic devices that:

a. "operate at or about room temperature based on the Coulomb blockade effect"; and/or

b. upon operation, "exhibit a substantially linear current increase between the 1st and 2nd nanoparticles (e.g. at about room temperature) as the potential difference between the two nanoparticles is increased above a threshold value"

represent "intended use" limitations regarding the reference device which is not afforded patentable weight or alternatively the above-recited operation characteristics (e.g. room-temperature operation by coulomb blockade and substantial linear current upon potential beyond threshold) would be deemed "inherent" since the:

the specification on page 10 (1st full paragraph) indicates that devices possessing the presently claimed nanoparticle composition (e.g. nanonparticle diameter range and inter-nanoparticle spacing) are operable at room temperature based on Coulomb blockade) and "exhibit a substantially linear current increase between the 1st and 2nd nanoparticles (e.g. at about room temperature) as the potential difference between the two nanoparticles is increased above a threshold value" (e.g. see specification bottom of page 10-top of page 11. It is noted that the PTO lacks facilities to make comparisons between prior art and claimed compositions/apparatus etc

12. Claims 1-3 are rejected under 35 U.S.C. 102(a,b,e) as being anticipated under 35 U.S.C. 102(a,b) over Wybourne et al. WO 98/53841 (12/98: filed 5/97).

The presently claimed invention is drawn to:

An organized array of metal clusters, comprising:

i. Monodispersed, ligand (e.g. thiol)-stabilized metal (e.g. Au) clusters having metal-cluster radii of @ 0.7 nm to @1.8nm;

ii. a linear, biomolecular scaffold (e.g.polynucleotides/ polypeptides: claim 2 which are "capable of forming alpha helices" such as polylysine: claim 3) , the metal clusters being bonded to the scaffold

iii. a substrate

the scaffold being coupled to the substrate at predetermined positions to form organized, one dimensional arrays that are electrically isolated from one another and having a linear increase in current above a threshold in applied voltage.

It is noted that "polylysine" *inherently* is a "helical peptide" within the presently claimed scope since "The free base form of polylysine readily forms an alpha helix" and "[M]oreover, lysine provides a terminal amino group that is oriented favorably in the alpha helix for ligand exchange reactions with the ligand-stabilized metal clusters". See specification at page 15, lines 15-24.

It is also noted that the term "array" is defined as "any arrangement of plural such clusters" **that is useful for forming electronic devices,** the bolded language representing "intended use" language which is not afforded patentable weight.

Similarly the newly added limitations:

"that are electrically isolated from one another" (e.g. product-by-process); and

"having a linear increase in current above a threshold in applied voltage" (e.g. inherent property of intended semiconductor device use) which address product-by-process limitations and/or address inherent characteristics addressing intended use (e.g. formation of semiconductor devices) are not afforded patentable weight.

Wybourne et al. teach electronic devices (e.g. transistors) which are formed by electrically isolated one dimensional arrays (e.g. see page 12 and fig. 1) that operate at or about room temperature based on the Coulomb blockade effect (e.g. see page 2, pages 14-15; figures 1 and 3, in which the arrays are composed of nanoclusters hat comprise:

A 1$^{st}$ nanoparticle comprising a metal nanoparticle core having a diameter of between about 0.7 nm and about 5 nm, e.g. with radii including @ 0.7 nm-1.8 nm (E.g.

page 3, lines 10-15; "metal clusters" with Au and Au55 most preferred { see fig. 7} with diameter of "about 1.2 nm": see page 6; claims 1 and 20) ; and

A 2nd nanoparticle physically spaced apart from the 1st metal nanoparticle at a distance of less than about 3 nm (e.g. "about 5nm" "ideally ... 1 to about 2nm": see page 6, lines 10-15), where the maximum physical separation between the 1st and 2nd nanoparticles is limited by the nanoparticles being coupled to a scaffold (e.g. see bottom of page 9-top of page 10) which is preferably "biomolecular" (e.g. polynucleotide; alpha helical polypeptide including polylysine: see e.g. page 3; examples and claims). The reference teaches plurality of intersecting biomolecular scaffolds used to form "transistor" and/or "circuit" devices (e.g. see pages 14-15; figures, especially figures 1-3; the claims, especially claims 27-28).

The Wybourne et al. reference arrays are useful to make electronic devices which:

a. "operate at or about room temperature based on the Coulomb blockade effect"(which is taught by the reference) which inherently results in the device "having a linear increase in current above a threshold in applied voltage" (e.g. see bottom of page 19 to top of page 20. It is again noted "intended use" limitations and properties resulting therefrom are not afforded patentable weight in a compound/composition claim as in the present case.

13. Claims 1-3 are rejected under 35 U.S.C. 102(a,b,e) as being anticipated by Hainfeld et al. US Pat. No. 5,521,289 (5/96: filed 7/94) alone and further in view of specification in order to demonstrate inherency. See e.g. MPEP 2131.01(d)

The presently claimed invention is drawn to:

An organized array of metal clusters, comprising:

i. Monodispersed, ligand (e.g. thiol)-stabilized metal (e.g. Au) clusters having metal-cluster radii of @ 0.7 nm to @1.8nm;

ii. a linear, biomolecular scaffold (e.g. polypeptides: claim 2 which are "capable of forming alpha helices" such as polylysine: claim 3) , the metal clusters being bonded to the scaffold

iii. a substrate

the scaffold being coupled to the substrate at predetermined positions to form organized, one dimensional arrays that are electrically isolated from one another and having a linear increase in current above a threshold in applied voltage.

It is noted that "polylysine" *inherently* is a "helical peptide" within the presently claimed scope since "The free base form of polylysine readily forms an alpha helix" and "[M]oreover, lysine provides a terminal amino group that is oriented favorably in the alpha helix for ligand exchange reactions with the ligand-stabilized metal clusters". See specification at page 15, lines 15-24.

It is also noted that the term "array" is defined as "any arrangement of plural such clusters" **that is useful for forming electronic devices,** the bolded language representing "intended use" language which is not afforded patentable weight.

Similarly the newly added limitations:

"that are electrically isolated from one another" (e.g. product-by-process); and

"having a linear increase in current above a threshold in applied voltage" (e.g. inherent property of intended semiconductor device use) which address product-by-process limitations and/or address inherent characteristics addressing intended use (e.g. formation of semiconductor devices) are not afforded patentable weight.

Hainfeld et al. disclose organothiol (e.g. "thiol-stabilized") nanometer diameter (e.g. see patent columns 1-2) metal clusters, especially thiol-gold clusters (e.g. see examples: e.g. col. 19-20), that are "substantially the same size" (e.g. monodispersed) which may be attached to "biological molecules" ( corresponds to "biomolecular scaffold": e.g see col. 2, lines 54) including polypeptides (e.g. polylysine: see see col. 8, especially lines 64) wherein the metal is preferably gold (e.g. see col. 8, lines 66). The use of Au (gold) of 50-70 would immediately envisage (e.g anticipate) Au55 or alternatively render obvious the selection of Au55 due to the small number of possible gold possibilities. The patent reference discloses metal cluster of nanomolar radii within the scope of the presently claimed range of "about 0.7 nm-1.8 nm" and thus anticipates the presently claimed range or alternatively obtaining additionally clusters of radii within the scope of the present range is within the scope of the reference teaching and thus prima facie obvious (e.g. see patent col. 2 and 19-20 and patent claims) or such a range would be obvious. The reference teaches attachment of metal clusters to biological molecules by ligand exchange and thus would be expected to inherently produce "organized arrays" within the scope of the presently claimed invention since the

reference teaches the same components (e.g. thiol ligands, metals and polypeptides) which are attached the same way (e.g. by ligand exchange) and thus would possess the same properties e.g. the formation of "organized" arrays. It is noted that the reference metal cluster arrays would appear to possess the same dimension (one-dimensional) or otherwise) as those presently claimed. The ability of the Wybourne et al. reference electronic device to:

a. "operate at or about room temperature based on the Coulomb blockade effect"(which is taught by the reference); and/or

b. upon operation, "exhibit a substantially linear current increase between the 1st and 2nd nanoparticles (e.g. at about room temperature) as the potential difference between the two nanoparticles is increased above a threshold value" which is not disclosed by the references, nevertheless represent "intended use" limitations regarding the reference device which is not afforded patentable weight or alternatively the above-recited operation characteristics (e.g. room-temperature operation by coulomb blockade and substantial linear current upon potential beyond threshold) would be deemed "inherent" since the:

the present specification on page 10 (1st full paragraph) indicates that devices possessing the presently claimed nanoparticle composition (e.g. nanonparticle diameter range and inter-nanoparticle spacing) are operable at room temperature based on Coulomb blockade) and "exhibit a substantially linear current increase between the 1st and 2nd nanoparticles (e.g. at about room temperature) as the potential difference between the two nanoparticles is increased above a threshold value" (e.g. see

specification bottom of page 10-top of page 11. It is noted that the PTO lacks facilities to make comparisons between prior art and claimed compositions/apparatus etc

14. Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hainfeld et al. US Pat. No. 5,521,289 (5/96: filed 7/94) [alone and further in view of specification in order to demonstrate inherency (e.g. of polylysine)] and Andres et al., Science Vol. 273, pages 1690-1693 (9/96).

The teaching of the Hainfeld reference alone or in view of the specification to demonstrate inherency is herein incorporated by reference in its entirety.

To the extent that the Hainfeld reference fails to explicitly disclose Au50 thiol "stabilized" clusters with diameters less than 2 nm the Andres et al. reference provides motivation to utilize Au50 thiol clusters with diameters less than 2 nm since the Andres et al. reference clusters are more stable (e.g. see page 1691-1692.

Accordingly, utilization of the Andres et al. reference clusters in the Hainfeld reference biological molecule/cluster molecules would be obvious to one of ordinary skill in the art at the time of applicant's invention due to the enhanced stability of these clusters as taught by Andres et al. reference.

***Double Patenting***

15. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA

1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

16. Claims 1-3 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-3 of U.S. Patent No. 6,872,971. Although the conflicting claims are not identical, they are not patentably distinct from each other because the patent claims teach devices which employ organized metal (defined in the disclosure to include Ag/Au/Pt/Pd and mixtures: see '971: col 3, lines 25-55) cluster (one dimensional)arrays" which are within the scope of the presently claimed invention: e.g. radii spaced apart @ 0.4 nm-.1.8 nm (vs. @0.7 nm to 1.8nm presently claimed) utilizing "biomolecular scaffold" ( DNA/alpha helical forming polypeptides : e.g. see col. 3) which are "electrically isolated from one another" (e.g. formed by aligning in electic field: see col. 15 and/or distance or less than about 5nm); and has a linear increase in current above a threshold in applied voltage (patent claim 3).

***Pertinent Art of Record:***

1. Grabar et al., Anal. Chem. (1995) Vol. 67 pages 735-743.

2.Clark et al., J. Vac. Sci. Technol. B Vol. 15(6) Nov/Dec 1997.

***Future Correspondences:***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bennett Celsa whose telephone number is 571-272-0807. The examiner can normally be reached on 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew Wang can be reached on 571-272-0811. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Bennett Celsa
Primary Examiner
Art Unit 1639

BC
May 10, 2005